

STANDARD TIME

FOR THE

United States of America, CANADA AND MEXICO.



Special attention to the subject referred to in the accompanying documents is respectfully requested

BY THE

AMERICAN SOCIETY OF CIVIL ENGINEERS,
127 EAST TWENTY-THIRD STREET,
NEW YORK.

SHOULD THE PERSON receiving this be unable to send a reply, he will confer a great favor by transmitting the circular to some person who may be able to do so.

1882

(7)

American Society of Civil Engineers.

COMMITTEE ON STANDARD TIME.

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General Manager New York, West Shore and Buffalo Railroad.

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PROFESSOR J. E. HILGARD, WASHINGTON,
Superintendent United States Coast and Geodetic Survey.

PROFESSOR T. EGLESTON, NEW YORK,
School of Mines, Columbia College.

GENERAL T. G. ELLIS, C. E.,
HARTFORD, CONN.

NEW YORK, March 1st, 1882.

At the Annual Meeting of the American Society of Civil Engineers, held at New York, on the 18th ultimo, resolutions were passed directing that a general invitation be extended to all persons and associations specially interested in the subject of Standard Time, to co-operate with the Society in an effort to effect a satisfactory and speedy settlement of this important public question.

The Committee on Standard Time has been requested to give effect to the wishes of the Society in this behalf.

Accordingly the Committee seeks for the desired co-operation and solicits a general expression of opinion from persons engaged in connection with the Railways and Telegraphs of the country, and from all others specially interested in the question throughout the United States, Canada and Mexico.

The Committee respectfully directs the attention of all concerned to the accompanying documents elucidating the subject.

The Committee cordially invites replies to the series of questions which accompany this. To all opinions with which the committee may be favored due weight will be attached.

After the receipt of replies a Convention, duly called, will meet at Washington, for the purpose of determining the Time System which it would be advisable to adopt. The President of the Society has been authorized to invite other Societies interested, the several State governments, the governments of Canada and Mexico, and the various departments of the general government at Washington, to send representatives to the Convention.

Replies are requested to be sent without delay (if possible, ~~being~~ ~~March,~~) addressed

JOHN BOGART,

Secretary A. S. C. E.,

127 EAST TWENTY-THIRD STREET,

NEW YORK.

SPECIAL NOTE.

As authorized and requested by the Society at the Annual Meeting, the Committee has issued a series of questions on a separate sheet, with the view of eliciting an expression of opinion from as many persons as possible. Some of the questions require explanations, but the Committee finds it difficult to narrow explanations to limits sufficiently small to be read by men whose time is severely taxed. The Committee, however, hopes that such men may favor them with replies, at least to the leading questions. To other persons who have more leisure and who may desire to consider the wider range of the subject and examine every point under discussion, the following documents are appended to the resolutions adopted by the Society and the report of the Committee. The details of the scheme for Regulating Time, referred to in the sheet of questions, will be found in Appendix No. 4, *to which particular attention is invited*:

No. 1. Communication read at the Convention of the American Society of Civil Engineers, at Montreal, June, 1881 (page 9).

No. 2. Extracts from an address read before the Association for the Reform and Codification of the Law of Nations, at Cologne, Prussia, August, 1881 (page 15).

No. 3. Extracts from an address read at the International Geographical Congress, at Venice, Italy, in September, 1881 (page 23).

No. 4. Cosmopolitan scheme for regulating time with accompanying diagram, (page 28).

STANDARD TIME.

Resolutions adopted at the Annual Meeting of the American Society of Civil Engineers.

January 18th, 1882.

Resolved, That the report of the Special Committee on Standard Time be accepted, and that the Committee is hereby requested to take such steps as it may consider necessary to obtain information to enable it to report definitely at a future meeting.

Resolved, That the authority is hereby given to the Committee to co-operate with other associations in furtherance of this important subject.

Resolved, That authority is hereby granted to the President of this Society to invite other Societies interested, and that representatives of State Governments, representatives of the Dominion of Canada, the Republic of Mexico and the various Departments of the General Government at Washington, be invited to meet in a convention as set forth in the report.

STANDARD TIME

REPORT OF THE SPECIAL COMMITTEE.

HOUSE OF THE SOCIETY, }
 NEW YORK, January 17th, 1882. }

The Committee appointed to consider the paper on Standard Time, for Railway and other purposes, read at the Montreal Convention, June, 1881, beg leave to report :

The Committee have examined the question referred to them, and fully recognize its great public importance. Practically it resolves itself into a proposition to reform our general time system. But difficulties of a peculiar nature present themselves. The Committee does not consider the problem insolvable ; but from its character it is clear that no single association, and that no one individual can solve it. Every member of society is interested in it, and it becomes necessary to consult many interests in order that general concurrence in any change be obtained.

Since the subject was brought under the notice of the Society in June last it has been taken into consideration by other associations : by the American Association for the Advancement of Science, at Cincinnati ; by the American Metrological Society, in New York ; by the Association for the Reform and Codification of the Law of Nations, at Cologne, Prussia ; by the International Geographical Congress, at Venice, Italy.

The members of the Committee have, since their appointment, conferred individually with many persons. They find it admitted on all sides that standard time for general use throughout the country is urgently demanded, and that the time has arrived when action should be taken.

To apprehend that the question is one of importance, it is only necessary to glance at the existing condition of our time service. Mistakes in the hour of the day are frequent. In every State—in every city or town—discrepancies are met which produce great aggregate inconvenience. Thousands of engagements are broken. Innumerable disappointments and losses result. In some cases loss of life is caused, and generally in consequence of defects in our time system, difficulties more or less serious constantly are experienced.

These difficulties are not confined to this country. They are experienced in all civilized communities where lines of rapid communication have been established. In the papers before the Committee it is urged that the question is one which affects every nationality, and therefore any change which may be proposed for this country should be such as to commend itself to other nations for adoption, so as ultimately to become universal.

The time system which we follow has been in use for centuries. It certainly answered all the purposes of mankind when there were no railways, no steamboats, and no telegraphs. In some respects the general advancement of civilized communities has outgrown the old custom: the yearly march of events more and more rendering it obsolete, and calling for reform to meet the condition of the age in which we live.

The Committee anticipate difficulty in effecting a desirable reform, as no change in a matter of this kind can be effected without interfering in a greater or less degree with long established usages and fixed habits of thought. The importance of the question, however, appears to the Committee to justify a united effort to obtain as complete a reform as may be desirable and possible.

The Committee feels assured that the general intelligence of the Community will cordially sympathize with an earnest movement to bring about such modifications in our time system as may be practicable and beneficial.

The people of the old world are influenced by traditional customs, and generally are attached to usages on account of their antiquity. They may adhere even to imperfections,—which years have made venerable. On this continent this feeling is modified. Americans are not, to the same extent, disposed to cling to conventional forms when these forms interfere with public convenience, or when they retard progress. It is, therefore, clear to the committee that we should not remain passive

until other nations take the initiative in Time reform. For in this country the imperious power of custom is less difficult to overcome.

If it be considered that the initiation of such a time system as the age demands properly falls within the province of the people of America, it becomes the more necessary that we should make earnest efforts to ascertain not simply what best will meet the requirements of the hour, but what will prove most generally beneficial to our own and succeeding generations throughout the world.

The Committee holds it expedient to obtain an expression of opinion on the various points which present themselves, from as large a number of practical and scientific men as possible. They consider it essential to have the views of those who have been and are now engaged in connection with the great lines of transportation in every State, and Province between the two Oceans.

Accordingly the Committee begs leave to recommend that such papers on Standard Time as it may consider necessary to set forth the subject, be printed, and, all who are prominently connected with Railway and Telegraph enterprises, or are in any way interested in the consideration of the question in the United States, in Canada, and in Mexico, be cordially invited to send replies to the series of questions which have been prepared, with the view of obtaining all shades of opinion.

The Committee more particularly draw attention to propositions 13 to 20 in the scheme which accompanies this. (See page 28.)

It has been held by those who have given attention to the subject that no scheme of time reform can be considered complete without provision for the ultimate removal of a defect familiar to many. The Committee accordingly direct attention to the suggestions submitted under the heading "Division of the day into hours." (See page 31.)

The Committee respectfully recommend that authority be granted by the Society to invite the co-operation of other scientific associations, and that of other bodies in the furtherance of this important object, and that all such Societies and government departments interested be invited in the name of the Society to attend a general convention to meet at New York or Washington on a day hereafter to be named, for the purpose of determining the Time System advisable to adopt.

SANDFORD FLEMING,

Chairman.

APPENDIX No. 1.

Paper read before the Convention of the American Society of Civil Engineers held at Montreal, Canada, June 15th, 1881.

CCXXXI.

(Vol. X.—December, 1881.)

ON UNIFORM STANDARD TIME, FOR RAILWAYS, TELEGRAPHS AND CIVIL PURPOSES GENERALLY.

By SANDFORD FLEMING, M. A. C. E.

The question which I have been requested to bring under the notice of the Convention, although not strictly of an engineering character, from its nature cannot fail to be of interest to the members of the American Society of Civil Engineers, many of whom have taken a prominent part in establishing the great lines of communication on this continent. To the large number of its members connected with the administration and development of the gigantic railway system extending between the two oceans, which in length are but little less than 100,000 miles, the subject becomes one of vital importance.

The occasion strikes me as peculiarly appropriate for submitting for your consideration the subject to which, with your permission, I will briefly refer. The Society meets for the first time beyond the limits of the United States, to find in the Dominion of Canada a cordial welcome. Many of its members, in attending this Convention, must have travelled long distances, and have experienced, in one way or another, some of the difficulties it is proposed should be removed.

The definition of civil time and its scientific determination for railway, telegraph and all ordinary purposes, is a problem to which a solution is imperatively demanded by the present condition of civilization.

The question has been examined by the American Metrological Society, New York ; the Imperial Academy of Science, St. Petersburg ; the Royal Society, London, England ; the Canadian Institute, Toronto, and other scientific bodies.

Its importance has been fully admitted, and expressions of opinion have been obtained as to the means of overcoming the difficulties which are experienced.

The citizens of the United States, and the subjects of Her Majesty, the Queen, occupy together the greater portion of North America. The most friendly relations exist between us, for, in the main, we are substantially one people, living under different Governments, with laws and customs essentially identical. On all sides we are satisfied to remain separated by our political affinities, having distinct theories and beliefs with respect to systems of government. But science, like every noble virtue, knows no national boundary. In this brief note I can recognize none. In alluding to matters which equally concern the United States and Canada, I shall refer simply to this country or to this continent.

As the continent extends across 105 degrees of longitude, an individual at the western limit finds himself seven hours of recorded time behind another individual at the extreme eastern side at the same moment of absolute time. Much of the intervening country is but thinly settled, but railways and telegraphs traverse from ocean to ocean, and we have every gradation of difference of time between the extreme limit of seven hours.

According to the system of notation which we have inherited from past centuries, every spot of earth between the Atlantic and the Pacific is entitled to have its own local time. Should each locality stand on its dignity, it may insist upon its railway and its other affairs being governed by the time derived from its own meridian. The smaller and less important localities, however, as a rule, have found it convenient to adopt the time of the nearest city. The railways have laid down special standards which vary, as has been held expedient by each separate management. In the whole country there is, so far, an irregular acknowledgment of more than one hundred of these artificial and arbitrary standards of time. The consequences of this system are unsatisfactory. They are felt by every traveller, and in an age and in a country when all, more or less, travel, the aggregate inconvenience and confusion is very great, and it will be enormously multiplied as time rolls on. If the system already results in difficulties to trouble our daily life, and to

lead to embarrassments which often occupy our courts of law, which, indeed, too often are the cause of loss of life, what will be the consequences in a few years, when population will be immensely increased and travel and traffic indefinitely multiplied, if no effort be made to effect a change?

The societies I have mentioned, after careful examination, have united in the opinion that a satisfactory change cannot be made too soon, and they have adopted resolutions pointing to a general uniformity and thorough accuracy in time reckoning. They believe that the course they have recommended will greatly facilitate the daily transactions of business men, greatly increase the safety of the travelling public, and immensely benefit the whole community.

It is proposed that the community unite in an effort to simplify the system now in use by reducing the number of time standards to a minimum by substituting for an indefinite number of irregularly established and purely local standards a few main or, as they may be termed, continental standards, each one having a fixed and well known relation to all the others. It is proposed to have these standards established and maintained by governmental authority; to have them regulated with precision through a common central observatory, and through these standards it is proposed to keep every town, city, railway and steamboat clock throughout the land as nearly as practicable in perfect agreement.

The plan of arrangements favored by the Metrological Society, New York, and the Canadian Institute, Toronto, is to have the standards so established that they will be exactly one hour apart; that is to say, while it would be nine o'clock at one standard it would be eight o'clock at the next to the west, seven o'clock at the following, and so on, by steps of exactly one hour. There would be no difference in the minutes and smaller divisions of time. If the time be ten minutes or thirty minutes past the hour at any one point, it would at the same instant, in absolute time, be ten minutes or thirty minutes past some hour at every point. The hours themselves only would differ, and they would differ only in designation according as the localities were east or west. At the same instant of absolute time every clock in the country would strike either one hour or another; the minute and second hands would always and everywhere be in perfect agreement.

It may be known to gentlemen present that the officers of the United States Signal Service have evinced a deep interest in the question, and in

the efforts to establish uniformity, accuracy and simplicity of system throughout the country, General Hazen, Chief Signal Officer, Washington, has expressed his earnest desire to contribute toward the public dissemination of standard time. He considers it eminently proper that the department over which he presides should, as far as practicable, assist in a work in which the whole community is interested, and he offers the active co-operation of the Signal Service in every part of the United States, in the maintenance of accurate standard time and giving it to the public by dropping time balls at all important stations.

Mr. Carpmael, Chief Director of the Meteorological Department of Canada, would similarly co-operate in every practicable way. There would, therefore, be no difficulty in giving effect to a scheme of introducing uniformity of time-reckoning throughout North America, so soon as the railway and telegraph authorities and the general public express concurrence.

It is proposed : 1. That the exact time should be determined astronomically at a central observatory. 2. That every town of any importance should have a public time signal station. 3. That arrangements be made for placing each station in electrical connection with the central observatory at a certain hour every day. 4. That each station be furnished with automatical apparatus for making the proper signal, either by dropping a time ball or by firing a gun at the proper moment. 5. That all the public and railway clocks in each and every locality be controlled electrically from the public time signal station.

I think it may fairly be claimed that no peoples are more progressive or more ready to adopt any needed change or manifest improvement than those who live in North America. And as there is no country except Russia where a greater necessity is presented, or a better field offered for the introduction of a comprehensive system of uniformity in time reckoning, it is more than probable that in this country the change will first be made.

As there can be little doubt that other countries will in due time follow the example of America, it is desirable that we should inaugurate a system which will readily commend itself by its appropriateness and simplicity. One that will have the best prospect of being ultimately adopted throughout the world. If we admit the principle that in a question of this kind it is not expedient to limit our view to any city or state or province, but to embrace in our system the whole of the con-

continent, it seems to follow that we should take a still broader view, and endeavor to apply the principle to all countries. Steam and electricity are rapidly altering the conditions of life everywhere, they are girdling the globe and bringing all countries nearer together. We get our unit measure of time from the earth's revolutions, it is, therefore, common property, and nothing can be more cosmopolitan in its nature. It is perfectly obvious to my mind that a system of uniform time which would be good for this country should be equally good for all countries on the face of the globe.

These views have met with the ready acquiescence of all who have given them careful consideration, and the system recommended by the several scientific bodies for adoption on this continent, commends itself as a scheme which all nations may, with advantage to themselves and to general interests, accept.

The American Metrological Society and the Canadian Institute have each passed resolutions substantially as follows :

“Resolved, That uniformity of time throughout the United States and Canada is demanded by the progress of events, and that a general system by which time may be reckoned in a uniform and accurate manner by the people of all nations throughout the globe is of the highest importance.

“Resolved, That a great service will be rendered to the world by directing the public mind to the subject, and by securing the general adoption of a well conceived system of uniformity, and that the Society is hereby authorized to co-operate with other bodies in recommending a comprehensive scheme based on the following propositions :

“1. Twenty-four standard meridians (one every 15 degrees of longitude) to be established around the globe for reckoning sectional or local time.

“2. One of the 24 standards to be selected as a time zero or initial meridian for reckoning cosmopolitan time.

“3. The time zero to coincide with the prime meridian to be common to all nations for computing longitude.

“4. The twenty-four standard meridians to be designated by names, or by letters of the alphabet, or by degrees of longitude, numbered from the prime meridian westerly.

" 5. The prime meridian, or zero for time and longitude, to pass near Behring Strait 180 degrees from Greenwich.

" 6. The division of the day into two halves of twelve hours each to be discouraged, and a single series numbered from I to XXIV, substituted. In the cosmopolitan day, or period of time between two successive passages of the sun over the prime meridian, the single division to be made absolute."

I may avail myself of this opportunity of mentioning that the scheme of cosmopolitan standard time is being brought before various European societies under distinguished auspices. His Excellency, the Governor-General of Canada, has been good enough personally to evince a deep interest in the question, and has been pleased to send communications to France, Belgium, Prussia, Austria, Russia and Switzerland. The subject will be considered by the Association for the Reform and Codification of the Law of Nations, at their meeting in August next, at Cologne, in Rhine-Prussia: and it will, on that occasion, find warm advocates in Dr. Barnard, President of Columbia College, and Mr. David Dudley Field, of New York. The question will be brought under the consideration of the International Geographical Congress at Venice, in September next, supported by such men as Mr. Otto Strove, Director of the Imperial Observatory, St. Petersburg; General Hazen, of Washington, and others.

In bringing these propositions under the notice of the American Society of Civil Engineers, I do not feel justified, on an occasion like the present, to refer at length to the voluminous papers which have been written, and the arguments which have been advanced, in connection with this question. Necessarily I have been brief, and I respectfully suggest, in order further to save the time of the Convention, that a committee be appointed to examine and report at a future meeting.

I feel it proper to add that as the great object is to determine and establish a system which will secure the greatest advantages to the community, it is of first importance to have the proposition carefully digested by those whose opinions have value with the public. An expression from this body, of educated, scientific and practical men, must carry with it great weight, and will exact respect in every quarter.

APPENDIX No. 2.

Extracts from an address read before the Association for the Reform and Codification of the Law of Nations, at Cologne, Prussia, August, 1881, by Dr. F. A. P. Barnard, Delegate from the United States of America.

THE REGULATION OF TIME.

The propositions which I have the honor to present to the consideration of the Conference affect the personal convenience of every inhabitant of every civilized land, and that not occasionally only, but continually. The regulation of time connects itself with every act and every incident of social, religious, commercial or industrial life. Banks open and close their doors, churches arrange the order of their services, transportation companies regulate the movements of their trains, courts and legislatures adjust the times of their assembling and their adjournment, theatres and other places of amusement announce the hours of their performances or exhibitions, and, finally, society fixes the times of its various appointments, for purposes of pleasure or business, in accordance with some standard, which, if not universally satisfactory, is at least universally understood. Thus the question, What shall be the standard of time? is one which affects every man every hour of his life, and one in which he is compelled to take an interest.

In the United States of America and in Canada the desirability of the adoption of some universally recognized system for the regulation of the divisions of the day has long been felt; and a movement commenced about two years ago, by two scientific organizations, viz., the American Metrological Society, of New York, and the Canadian Institute, of Toronto, Canada, has already been successful in drawing public attention to a definite scheme of time-regulation for the Continent of America, which is rapidly gaining ground in the favor of the people.

It is to be noticed, in the first place, that the time kept by clocks and watches in our country is not, generally, the exact local time of the place where the owners of such timepieces reside. Upon every great line of railway it is indispensable, in order to secure safety and regularity in the movement of trains, that the time kept should be uniform from end to end. And as some of these long lines extend over from five to ten degrees of longitude, while the standard time kept by them is usually that of one of their termini, it follows that, at different points of the road, the railway time differs from the local time, ten, twenty, thirty or more minutes. Yet, such is the relative importance of the railway traffic, in comparison with that of interests purely local, that, in practice, the railway time supersedes the local time, and all the affairs of life are regulated in accordance with it. In some large towns two kinds of time are kept; as, for instance, at Buffalo, New York, where, in the same houses, may be found two clocks, one of them giving the time of the place, and the other that of New York City, which is the railway time, and is twenty minutes faster.

It sometimes happens that towns not distant from each other are situated on different lines of railway keeping different times. In passing, by ordinary vehicles, from one of these towns to another there is experienced the inconvenience of finding one's watch entirely out of harmony with the time-keepers of the locality visited. But a still greater inconvenience occurs in those towns which lie at the intersections of two or more important roads—and there are a good many such—for here it is necessary to keep account of as many systems of time as there are intersecting ways. From an investigation made by Professor Cleveland Abbe, of the United States Weather Signal Office, at Washington, it appears that the railway times kept by different transportation companies in the United States correspond to no fewer than seventy meridians, and the total number of such varieties is probably not less than one hundred. Now, so far as the transaction of the ordinary affairs of life in each particular locality is concerned, this extraordinary variety is of no consequence to the inhabitants. But in all matters which concern the mutual relations of the inhabitants of different places the case is otherwise. Without a knowledge of the times of both places it is quite possible that appointments in regard to affairs of important concern may be wholly disconcerted. And without a similar knowledge one may fail to meet a train on which he had counted, and may thus be subjected

to unanticipated delay and other consequent disadvantages. It is, of course, hardly necessary to mention the degree to which the usefulness of the time-tables issued by the various transportation companies is impaired, for the purposes of the traveller, when the time standards of all these companies are different. But the embarrassment to the tourist, however great, is of less importance than that which is suffered by the permanent resident.

Now, considering the fact that, for our own Continent of America the time actually kept at any place is usually purely conventional, and is not the true local time of the place itself, considering that this is also true in England, and is, probably, to a great extent true of the Continent of Europe, and considering that identity of the conventional with the local time is unimportant when the standard of time actually used is understood, it has seemed to us that by the adoption of a system according to which all time-keepers throughout the world might be made to agree as to the minute and second, and to differ only, as longitudes differ, in regard to the hour, all the confusion which exists in consequence of the present variety of time-standards might be wholly eliminated, to the great benefit of the people of all civilized lands. The adoption of this system would involve the recognition of twenty-four fixed meridians, distant from each other by a constant difference of fifteen degrees of longitude, and determined in position by some one of the number distinguished as the *prime* or *zero* meridian. The moment of the passage of the mean sun over each of these meridians is to be regarded as the hour of mean noon for that meridian, and for all places which are nearer to it than they are to any other. Thus the largest difference which can occur between conventional time and true local time will be thirty minutes, and the hour will change at a line half-way distant between any two meridians.

The system here described was proposed originally for the United States by Professor Cleveland Abbe, of the United States Signal Service (as mentioned above), in a report to the American Metrological Society, and also (without concert with Professor Abbe) by Sandford Fleming, Esq., late Chief-Engineer of the Canadian Pacific Railway, and now titular Chancellor of Queen's University, at Kingston, Ont., in a paper read by him before the Canadian Institute, and since published. In these papers it was proposed to adopt, for the American Continent, five meridians, of which the central one should be situated six hours west of

Greenwich, and should pass almost centrally through the City of New Orleans. The time of this meridian, being that prevailing through the principal States of the Mississippi Valley and the British province of Manitoba, is distinguished as *valley time*. The five-hour meridian passes near New York, and governs the States lying on the Atlantic, together with the two Canadas, giving them what is hence called *Atlantic time*. The four-hour meridian crosses the island of Newfoundland, and gives what is called *eastern time* to that island, and to Nova Scotia, New Brunswick and the remaining British possessions east of Canada. The seven-hour meridian passes through the City of Denver, and almost exactly over the United States Signal Station on the summit of Pike's Peak, more than 14,000 feet high, in Colorado. It gives time to the States, Territories and provinces lying on and about the great central ridge of the Continent, which is hence called *mountain time*. The eight-hour meridian falls a little east of San Francisco, and almost exactly on the small sea-coast town of Santa Barbara, in California. From this the States of the Union which lie on the Pacific, and the British provinces on the same ocean, derive their time, which it is proposed to distinguish as *Pacific time*.

The bounding lines between the successive meridians, at which the count of the hour shall change, it is not proposed to define with the same geometrical precision which characterizes the meridians themselves. The idea is rather to follow any well-known natural or political divisions which fall approximately midway between the meridians, and which will serve as easily remembered reference boundaries. On the American Continent such lines of demarcation are easily found. The States and provinces which touch the Mississippi river will use valley time; the Canadas, and the States of the Union which lie east of these valley States, and most of which touch the Atlantic, will use Atlantic time; the British provinces farther eastward will use eastern time; the States and provinces which touch the Pacific will use Pacific time; and all those which lie between the Pacific States and the valley States will use mountain time.

The means by which we expect to establish this system on the American Continent, are partly the voluntary action of the transportation companies; partly the co-operation of municipal corporations and chambers of commerce, and partly local legislation. Already many local organizations have taken steps for the establishment of time balls, and

other time signals, in furtherance of the practical introduction of the system. The State of Connecticut has enacted a statute making the use of New York time compulsory upon all transportation companies within her limits. The chief signal officer of the United States, General W. B. Hazen, has warmly interested himself in the scheme, and has offered the services of his corps to operate daily any apparatus for the distribution of time which may be erected at any of the numerous stations of his extensive service. The same officer, and associated with him Mr. Chancellor Fleming, above referred to, and the present speaker, have been constituted a joint-committee, on the part of the American Metrological Society and the Canadian Institute, to present this subject to the consideration of the International Geographical Congress, which is to meet in Venice on the 15th of September proximo, in the hope of obtaining for it the approval of that body; and I have been specially charged by the Metrological Society just mentioned, of which I have the honor to be president, to ask for it the favorable consideration of this Association.

The Governor-General of Canada, the Marquis of Lorne, has been pleased to interest himself actively in promoting the success of the movement. The papers relating to it which have been published by the two associations, whose titles have just been mentioned, have been forwarded by Lord Lorne, through the British Foreign Office in London, to countries with which Great Britain is in diplomatic relations, and to their scientific associations; and from the Imperial Academy of Sciences at St. Petersburg have been received copies of a report from a committee, of which the eminent astronomer Otto Struve was chairman, cordially approving the project, which report was adopted by the Academy.

Two or three minor features of the scheme contained in the resolutions proposed remain to be mentioned. The first of these is the proposition to abolish the present division of the day into two equal portions of twelve hours each, and to employ instead a continuous count running from one to twenty-four hours in each day. The division at present in use is not a natural one. It is founded, presumably, upon the custom of astronomers to begin the day at the meridian passage of the sun, or the habit of the people to fix the moment of apparent noon by observing the coincidence of the shadow of a vertical stile with a line drawn north and south. The natural division of the day is into a light portion

and a dark portion. These portions are always and everywhere unequal, except for a single day in the year, or for a single great circle of the earth—the equator. No exact system for the uniform division of time can, therefore, be founded upon them. On the other hand, no disadvantage can arise from regarding the day as a unit subdivided into twenty-four equal fractions, a mode of division once very general, at least in Italy, and hardly yet entirely abandoned; while there are very appreciable disadvantages attending the present division into twelve-hour moieties. The first of these is the necessity of using always in speech the word *forenoon* or *afternoon*, in order to identify the portion of the day to which any hour which happens to be mentioned is to be referred; or, in writing, to place after the number of the hour the explanatory suffix, A. M. or P. M. Another, and even greater, is the uncertainty in railway time-tables as to whether a particular hour is an hour of the night or of the day. The compact form of these tables renders it impossible always to introduce the necessary specifications in their columns, and the inquirer is thus often left at a loss. Some of these tables, in order to remove the embarrassment, have employed the expedient of printing the hours of the night in white letters upon a black ground, while those of the day are printed in the usual way—with black letters upon a white ground; but the very adoption of this expedient is a confession of the existence of an evil which we may easily perceive to be quite unnecessary. Let the hours of the day be only continuously numbered from beginning to end, and there will never be any uncertainty as to which part of the day is meant.

Another of the secondary features of the scheme is the designation of a zero meridian. The zero meridian is that from which terrestrial longitudes begin to be reckoned, and that at which, at the close of the day, the count of the day in the monthly calendar shall be momentarily the same for the entire globe. Any meridian which might be chosen, and which should be generally accepted, would answer for this purpose; but such a selection ought not to be made through mere idle caprice. Regard should be had to usages actually existing; and if there is any meridian which has already become more familiar than any other to the great majority of mankind, that circumstance should be counted in its favor. In a contribution made by me some ten years ago to a provisional code of international law drawn up under authority of a resolution of this Association, by the Hon. David Dudley Field, afterwards President

of the Association, I endeavored to assign some reasons why the meridian of Greenwich is entitled to be regarded as rightfully the first meridian for purposes of longitude. But the same reasons apply with equal force to the inferior meridian of Greenwich—that is to say, to the meridian twelve hours distant in time, and 180 degrees distant in longitude from Greenwich itself ; and as I have found, in consultation with others, that there might be danger of awakening national susceptibilities by insisting on Greenwich (though, for myself, I fail to find this consideration serious), I have yielded my first opinion, and propose to fix the first meridian for time and for terrestrial longitude at the 180th degree from Greenwich, so that this first meridian will fall almost entirely upon the open ocean. As in the monthly calendar the change of count must begin first at some particular meridian, it is desirable that this change shall take place, if possible, beyond the limits of all habitable lands ; and this is true of the meridian proposed, since, except a small portion of wild and desolate sub-arctic Kamschatka, it scarcely touches any portion of the earth's surface uncovered by water. At this assumed first meridian, therefore, the day in ordinary chronology will begin when the mean sun is on the meridian of Greenwich ; so that, in fact, it will be identical with the astronomical day as reckoned at that observatory.

The last of the secondary features of the scheme which I have to notice, is the proposition to establish, for purposes of pure chronology, and for the facilitation of synchronous observations in science, a special time-reckoning under the name of *cosmopolitan time*. So long as the dimensions of the known world were limited in longitude between the Indies on the east and the Canary Islands on the west, there was no danger of a confusion of chronology to arise from a mistake of an entire day in a date. But at the present time, and since civilization has encircled the entire globe, it is a fact that there are certain hours in every twenty-four, during which, for one entire half the habitable world, the date is a unit more advanced in the monthly calendar than in the other. The change of count must have a beginning somewhere. In the absence of any distinct convention on the subject, it is generally understood that this change begins somewhere in the Pacific Ocean. It happens, therefore, that at the moment when the sun is on the meridian opposed to that of Greenwich, the date for all Asia and all Continental Europe may be, for example, the first of January before noon, while for the entire American Continent it is still the thirty-first of December.

On the other hand, when, twelve hours later, the sun is on the Greenwich meridian, the date will be the first of January for all the world, but will be afternoon for Asia and Europe and forenoon for America. At present the change of count, as above observed, is supposed to begin in the Pacific Ocean. But if we are to be exact, it ought to begin at some certainly defined meridian ; and the present proposition is to make it begin at the meridian distant twelve hours from Greenwich.

The time determined by the proposed zero meridian is, according to a suggestion of Mr. Fleming adopted in the resolution, to be distinguished as cosmopolitan time, and might equally be called universal or absolute time. Any observation made in cosmopolitan time will be fixed with absolute certainty both in the chronological sequence and in the hours of the day, and it can easily be converted, by the addition or subtraction of an even number of hours, into the particular time of each standard meridian. Mr. Fleming proposes, also, that the hours of this universal time shall be distinguished by symbols or letters rather than by numbers. The value of this suggestion consists in the fact that, by means of it, the danger will be averted of ever confounding cosmopolitan time with that of any other except the prime meridian. It is not otherwise insisted on as a feature of special importance.

APPENDIX No. 3.

Extracts from an address read at the International Geographical Congress, at Venice, Italy, September, 1881, by Sandford Fleming, Delegate from the United States and Canada.

THE ADOPTION OF A PRIME MERIDIAN AND TIME-
ZERO, TO BE COMMON TO ALL NATIONS,

IN CONNECTION WITH

THE REGULATION OF TIME.

The unification of initial meridians has been advocated in the interests of geography, astronomy and navigation. I shall accept all the arguments which have been advanced on behalf of these extremely important interests, and crave your indulgence while I submit additional reasons for the establishment of a common prime meridian for all the world.

I propose to direct your attention to arguments which spring from the relations of time and longitude and the rapidly growing necessity in this age for reform in time reckoning.

If we take into view the whole earth, we have at the same instant in absolute time, noon, midnight, sunrise, sunset, and all intermediate gradations of the day. The telegraph system, which is gradually spreading like a spider's web over the surface of the globe, is practically bringing this view of our sphere before all civilized communities. It leaves no interval of time between widely separated places proportionate to their distances apart. It brings points remote from one another, enjoying all the different hours of daylight and darkness, into close contact. Under our present system of notation, confusion is developed, and all count of time is thrown into disorder.

The local civil day begins twelve hours before and ends twelve hours after the sun passes the meridian of a place. As the globe is constantly revolving on its axis, a fresh meridian is every moment passing under the sun. As a consequence, a day is always somewhere beginning and

always somewhere ending. Each spot around the circumference of the sphere has its own day, and therefore there are, during every diurnal revolution of the earth, an infinite number of local days, all beginning within the space of twenty-four hours, and each continuing for twenty-four hours. These days overlap each other, and, theoretically, they are as perfectly distinct as they are infinite in number. There are no simultaneous days except on the same meridian, and as the different days are always in the various stages of advancement, difficulties must necessarily result in assigning the period when an event takes place. The telegraph may give the exact local time of the occurrence, but it will be in disagreement with the local times on every other meridian around the earth. An event occurring any one day may on the instant be announced somewhere the previous day, or somewhere else the following day. About the period when one month or year passes into another month or year, an occurrence may actually take place in two different months, or in two different years, according to local reckoning.

It will be readily conceded that this system is extremely unscientific : that it possesses all the elements of confusion, and produces a degree of ambiguity which cannot long be tolerated ; that as time rolls on it will lead to grave complications in social and commercial affairs ; that it will produce serious errors in chronology ; that it will lead to litigation, and result generally in difficulties of various kinds. According to our present system, there can be no absolute certainty with regard to time unless the precise geographical position be specified as an important element of the date. It is evident that it will be exceedingly inconvenient and troublesome, when rapid communication becomes universal, to bring the times of different countries and localities into agreement ; and that the necessity for doing so by additions or deductions for differences in longitude will undoubtedly clog the ordinary business of the world.

It is proposed to obviate the difficulty by a system of cosmopolitan time reckoning, the chief peculiarity of which is the adoption of one particular meridian as a standard time-zero, and by an extremely simple arrangement regulating the times at all places on the globe by a direct reference to the common standard. It is obvious that the world's time-zero should coincide with the prime meridian to be used in common by all nations for reckoning terrestrial longitudes.

I proceed to submit special and more urgent reasons for the selection of a common initial meridian and time-zero. I shall confine

my observations to the case of North America, a country with which I am most familiar, but the remarks I venture to submit will doubtless apply to other great divisions of the earth's surface.

The gigantic system of railways and telegraphs which has been established in America has developed social and commercial conditions which never previously existed in the history of the human race. These conditions have affected the relations of time and distance in a manner which shows that the system of notation which we have inherited is defective ; that it leads to confusion, causes loss of time and disturbs the arrangements of travellers and business men ; that it frequently results in loss of life, and leads to difficulties of various kinds ; that under the circumstances which have followed the extensive employment of steam and electricity as means of rapid communication, it is generally inappropriate.

The question has therefore become a matter of great public importance, and attention is seriously directed to the simplest and best means of removing an impediment to commerce and general intercourse.

The system which we follow, and which has been followed for ages, was not so objectionable half a century back, when the electric telegraph was unknown and the horse was almost the only locomotive. The system is based on the theory that time is regulated everywhere by the passage of the sun over the meridian of each separate locality ; that the period between any two solar passages at any one place is divided into halves, known as *ante-meridian* and *post-meridian*, each half being subdivided into twelve hours, and that the two halves together constitute a day.

According to the recognized theory, as already stated, every spot on the surface of the globe differing in longitude has an entirely distinct day and a local time peculiar to itself. Except on the same meridian there are no simultaneous days or hours or minutes. Everywhere the days and divisions of the day vary, and the variations are infinite.

In the case of North America, the continent extends across one hundred and five degrees of longitude. Within its extreme eastern and western limits it is possible to draw many thousand distinct meridians, and, following rigidly the prescribed theory, we may have as many thousand standards of time, not two of which would be in harmony. The railway authorities have come face to face with the difficulty, and they have from time to time met it as circumstances dictated. In order to operate the long lines of railway with some degree of safety, each sepa-

rate manager has been obliged to ignore the different local times, and arbitrarily adopt a special time for the movement of trains on the particular lines under his charge. The railway guide-books publish at least seventy-five (75) irregularly chosen standards of time, employed for the running of trains in the United States and Canada. Every city and town of importance has its own time, occasionally coinciding, but frequently differing from the nearest railway standard. The public have been obliged to accommodate themselves to this irregular system, but it has become exceedingly inconvenient and irksome, and a scheme which will introduce a time-system characterized by uniformity and simplicity cannot fail to be cordially welcomed.

For the reasons stated, an earnest movement has begun in America, with the view of establishing reform in time-reckoning. The question is engaging the attention of the Canadian Institute of Science, the American Metrological Society, the American Society of Civil Engineers, the American Association for the Advancement of Science, and other societies. The community generally and the great railway and telegraph interests are being awakened to its importance.

It is felt that the question is one in which all countries have an interest, and although it has presented itself, possibly more prominently in America than elsewhere, it is felt that Americans should take no narrow view of a scientific matter of world-wide interest.

It is held by those who have seriously considered the subject, that a solution of the problem which would be good for America would be advantageous to other countries. It is considered that in introducing a reform in time reckoning in North America, the system should be such as would commend itself generally; that it should be one which by its appropriateness and simplicity would have every prospect of being adopted ultimately throughout the world.

A highly important feature of the movement is to take every means to render the system generally acceptable, so that, whenever the necessity may arise in any other community for its introduction, it may be spontaneously adopted; a course calculated to secure ultimately complete uniformity in all countries.

I beg leave to submit an outline of a proposition for defining and regulating civil time which is favored in many quarters in Canada and the United States of America.

(See *Cosmopolitan Scheme for Regulating Time.*)

It must be evident that the principles laid down would be the ready means of meeting the difficulties to which I have referred, and that it is practicable to secure uniformity, great simplicity, perfect accuracy and complete harmony. The times of places widely differing in longitude would differ only by entire hours. In all other respects, standard time in every longitude and latitude would be in perfect agreement. In theory, every clock in the world would indicate some one of the twenty-four hours at the same instant, and there would be perfect synchronism with the minutes and seconds throughout the globe.

By the system proposed, instead of an infinite and confusing number of local days, following the sun during each diurnal revolution of the earth, we should have twenty-four well-defined local days only; each local day would have a fixed relation to the others, and all would be governed by the position of the sun in respect to the Prime Meridian. These twenty-four local days would succeed each other at intervals of one hour during each successive diurnal revolution of the globe. The day of each locality would be known by the letter or other designation of its standard meridian, and the general confusion and ambiguity which I have set forth as the consequences of the present system would cease to exist.

Some such system as that proposed is imperatively demanded in America. It cannot be doubted that the general adoption of the scheme portrayed would be conducive to the convenience of all mankind. The first step towards its introduction is the selection of an initial meridian for the world. Accordingly I feel justified in asking you favorably to consider the resolutions which I have now the honor to submit.

APPENDIX No. 4.

This is a revision of the original scheme for regulating time published in the proceedings of the Canadian Institute, Toronto, and the American Metrological Society, New York. Submitted by Sandford Fleming, Chairman of the Special Committee.

COSMOPOLITAN SCHEME FOR REGULATING TIME.

1. It is proposed to establish one universal standard time common to all peoples throughout the world, for the use of railways, telegraphs and steamboats, for the purposes of trade and commerce, for general scientific observations, and for every ordinary local purpose.

2. It is proposed that standard time, everywhere, shall be based on the one unit measure of time, denoted by the diurnal revolution of the earth, as determined by the mean solar passage, at one particular meridian to be selected as a time zero.

3. The time zero to coincide with the initial or prime meridian to be common to all nations for computing terrestrial longitude.

4. The time zero and prime meridian of the world to be established with the concurrence of civilized nations generally.

5. For reasons elsewhere given it is suggested that the prime meridian and time zero shall be established through the Pacific Ocean, entirely avoiding the land of any nationality, as shown in the plate. (Fig. No. 1.)

6. For the purpose of regulating time everywhere it is proposed that the unit measure, determined as above, shall be divided into twenty-four equal parts, and that these parts shall be defined by standard time meridians, established around the globe, fifteen degrees of longitude or one hour distant from each other.

7. It is proposed that the standard time meridians shall be denoted by the letters of the English alphabet, which, omitting *J* and *V*, are twenty-four in number. The zero meridian to be lettered *Z*; the remaining meridians to be lettered in order from east to west, as shown on the plate (See Figs. Nos. 1, 2, 3 and 4.)

8. It is proposed that standard time, determined as above, shall be employed for general and local purposes in accordance with the following definitions:

STANDARD TIME FOR GENERAL PURPOSES.

9. It is proposed that the unit measure of time, determined as above, shall be held to be a *day absolute*, and irrespective of the periods of light and darkness which vary with the longitude, to be common to the whole world for all non-local purposes. To distinguish it from ordinary local days, this space of time may be known as the "Cosmopolitan" or "Cosmic Day." The hours, minutes and seconds of the cosmic day, and the days themselves may be distinguished by the general term *cosmic time*.

10. Cosmic time may be used to promote exactness in chronology ; it may be employed in astronomy, navigation, meteorology, and in connection with synchronous observations in all parts of the world. It may be regarded as the time which would be used in ocean telegraphy and in all operations of a general or non-local character.

11. It is proposed to distinguish cosmic from local time by denoting the hours of the former by letters, and of the latter, as at present, by numerals.

12. It is proposed that cosmic time shall be so lettered that the hours will correspond with the twenty-four standard time meridians. When the sun passes meridians *G* or *N* it will be *G* or *N* time of the cosmic day. When it becomes *Z* time, that is to say, when the (mean) sun passes the zero meridian, at that moment, one cosmic day will end and another begin.

STANDARD TIME FOR LOCAL PURPOSES.

13. It is proposed to constitute the lettered divisions of the cosmic day, standards for regulating local time everywhere. Thus reducing the number of standards to twenty-four and furnishing a ready means of passage from cosmic to local time and from one local to any other local time.

14. It is intended that local time at any place on the surface of the globe shall generally be regulated by the standard meridian nearest or most convenient to such place in longitude.

15. It is proposed that the local day at any place shall commence twelve hours before, and end twelve hours after the (mean) solar passage at the standard meridian which governs the time at that place. Local days, so determined, to be regarded in the same light in all ordinary affairs as local days under the present system.

16. It is proposed that local time at any place or in any section of country shall be known by the letter of the particular standard meridian by which it is governed. If local time at any place or in any section be governed by meridian *S* it may be known as Standard *S* time. If by meridian *T* it may be distinguished as Standard *T* time and understood to be one hour later than standard *S*, two hours later than Standard *R*, and so on.

THE DISTRIBUTION OF STANDARD TIME.

17. It is proposed that standard time shall be determined and disseminated under Governmental authority ; that time signal stations be established at important centres for the purpose of disseminating correct time with precision, and that all the railway and local public clocks be controlled electrically from the public time stations, or otherwise kept in perfect agreement.

APPLICATION OF THE SYSTEM IN NORTH AMERICA.

18. The adoption of the system in the United States and Canada, would, exclusive of Newfoundland and Alaska, have the effect of reducing the standards of time to four. These four standards, *R*, *S*, *T* and *U*, precisely one hour apart, would govern the time of the whole country, each would have the simplest possible relation to the other, and all would bear equally simple relations to the other standards of the world.

19. It is not proposed to prescribe the exact limits of the sections of country within which, time would be regulated by each standard. In this matter, general convenience would be the guiding principle. As a rule the division lines would assume a central position between the standard meridians. There would be no difficulty in finding division lines either natural, political or commercial, which would fall about midway between each of the four meridians. Probably in some cases a city or town may lie equidistant from two meridians. In such cases geographical considerations, business relations, and other local circumstances, would decide which standard should be adopted. The time used by the railways would be determined by precisely similar considerations. The time tables and railway clocks would always clearly indicate the standards which regulated the running of trains over particular sections.

20. It is suggested that standard time would generally prevail in the several states and provinces as follows :

STANDARD TIME, MERIDIAN <i>U</i> .	STANDARD TIME, MERIDIAN <i>T</i> .	STANDARD TIME, MERIDIAN <i>S</i> .	STANDARD TIME, MERIDIAN <i>R</i> .
California. Nevada. Oregon. Washington T. Br. Columbia. Vancouver Island. Idaho. Utah. Arizona.	Mexico. Texas. Kansas. Colorado. Nebraska. Wyoming. Dakota. Montana. Manitoba. Saskatchewan. Keewadin.	Louisiana. Mississippi. Alabama. Arkansas. Tennessee. Missouri. Kentucky. Illinois. Indiana. Iowa. Minnesota. Wisconsin. Michigan.	Florida. Georgia. S. Carolina. N. Carolina. Virginia. Ohio. Maryland. Delaware. Pennsylvania. New Jersey. New York. Rhode Island. Connecticut. Massachusetts. Vermont. New Hampshire. Maine. Ontario. Quebec. New Brunswick. Prince Edw'd I'd Nova Scotia.

21. Reference to the diagram will show that the four meridians, *U*, *T*, *S* and *R*, at intervals each from the other of one hour, would effectively regulate the time of day throughout the whole extent of the United States, Canada and Mexico. But the number of standards can be increased or reduced without interference with the harmony, and cosmopolitan application of the general scheme. Theories have been advanced, still further to reduce the number of standards. If two standards be deemed expedient meridians *U* and *R* may be selected; one adapted to the eastern, the second to the western half of the Continent. If on the other hand the opinion prevail, that there should be one uniform time for the whole of the North American Continent, meridian *S* might be selected. Meridian *S* would be 90° to the east of the Prime Meridian proposed for all nations. It would pass through Lake Superior and the Mississippi Valley to the Gulf of Mexico, It would be generally central, and would best suit the great body of the population.

THE DIVISION OF THE DAY INTO HOURS.

22. The present division of the day into halves, and these halves into twelve hours, each series of twelve hours being numbered identically,

leads to error and inconvenience. This division necessitates the use of the expressions *ante meridian* and *post meridian*, or forenoon and afternoon, or the contractions A. M. and P. M., to identify the particular half day to which any hour belongs. In railway time tables the expressions ordinarily used to specify the half day are liable to be omitted, misplaced or misunderstood. The consequence is that innumerable mistakes are made and uncertainty frequently arises.

The halving of the day and the use of dual numbers to denote the hours is a very old practice, but it confers no single benefit; and, beyond its claim to antiquity, has nothing whatever to recommend it. While it will doubtless be extremely difficult to do away with the custom so firmly established by long usage, it is nevertheless important to ascertain what change would be most advantageous, and what modifications, if any, would be most likely sooner or later to meet with general acceptance. Two alternative plans have been suggested.

Firstly.—To have only one series of hours in the day, extending from midnight to midnight, and numbered from one to twenty-four without interruption.

Secondly.—To number the hours between midnight and noon (one to twelve) precisely as at present, and to denote the hours between noon and midnight by letters of the alphabet.

Both propositions would obviate the necessity of adding words of explanation, or otherwise specifying, whether the hours were forenoon or afternoon. The first would be extremely simple. The second would have the advantage of distinguishing the forenoon from the afternoon hours by the character of the symbols employed to denote them. The hours of the first half of the day would be known by numerals, of the second half by letters. The second plan would have other advantages to recommend it.

The employment of cosmic time letters to denote the hours from noon to midnight, in local reckoning, would make the designation of the afternoon hours everywhere concurrent.

According to the scheme herein submitted there would be, between the Atlantic and Pacific coasts, four standard time meridians, *R*, *S*, *T* and *U*. (See Fig. 4.) The relative time of the day for a few hours before and after noon under these several meridians would be as given in the table appended. An examination will show that under plan number two the noon letter in every instance would agree with the

TABLE OF CONCURRENT TIME THROUGHOUT NORTH AMERICA.
The first Column indicates Cosmic Time; the remaining Columns Local Time. Under each Standard for Local Time is given the Present Division of Hours, Ante Meridian and Post Meridian, side by side with the two Alternative Plans suggested.

COSMIC TIME.	LOCAL TIME UNDER EACH SEPARATE MERIDIAN.											
	STANDARD R.				STANDARD S.				STANDARD T.			
	Alternative Plan.		Present Division of Hours.	Present Division of Hours.	Alternative Plan.		Present Division of Hours.	Present Division of Hours.	Alternative Plan.		Present Division of Hours.	Present Division of Hours.
	No. 1.	No. 2.			No. 1.	No. 2.			No. 1.	No. 2.		
M.....	7	7	6	6	6	6	5	5	5	5	4	4
N.....	8	8	7	7	7	7	6	6	6	6	5	5
O.....	9	9	8	8	8	8	7	7	7	7	6	6
P.....	10	10	9	9	9	9	8	8	8	8	7	7
Q.....	11	11	10	10	10	10	9	9	9	9	8	8
R.....	12	12	11	11	11	11	10	10	10	10	9	9
S.....	1	13	12	12	12	12	11	11	11	11	10	10
T.....	2	14	1	13	13	13	12	12	12	12	11	11
U.....	3	15	2	14	14	14	1	13	13	13	12	12
W.....	4	16	3	15	15	15	2	14	14	14	1	13
X.....	5	17	4	16	16	16	3	15	15	15	2	14
Y.....	6	18	5	17	17	17	4	16	16	16	3	15
Z.....	7	19	6	18	18	18	5	17	17	17	4	16

letter by which the standard meridian of the locality would be known. Advancing westerly, local time would become one hour slower from meridian to meridian, as indicated by the numerals which denote the forenoon hours; while the afternoon letters would everywhere be in perfect agreement. The time of New York would be regulated by Standard *R*, Chicago by Standard *S*, Denver by Standard *T*, and San Francisco by Standard *U*, each standard differing by steps of one hour, yet at any given hour in the afternoon, say at *W*, it would be *W* o'clock at the same moment in absolute time from the Atlantic to the Pacific.



COSMOPOLITAN SCHEME F

FIG. 1.

*Projection on the suggested Behring Strait,
or Pacific Initial Meridian.*

FIG. 2.

*Projection 90° Westerly from the zero
meridian.*



FOR REGULATING TIME.

OVER

FIG. 3.

Projection 180° Westerly from the zero meridian



FIG. 4

Projection 270° Westerly from the zero meridian

